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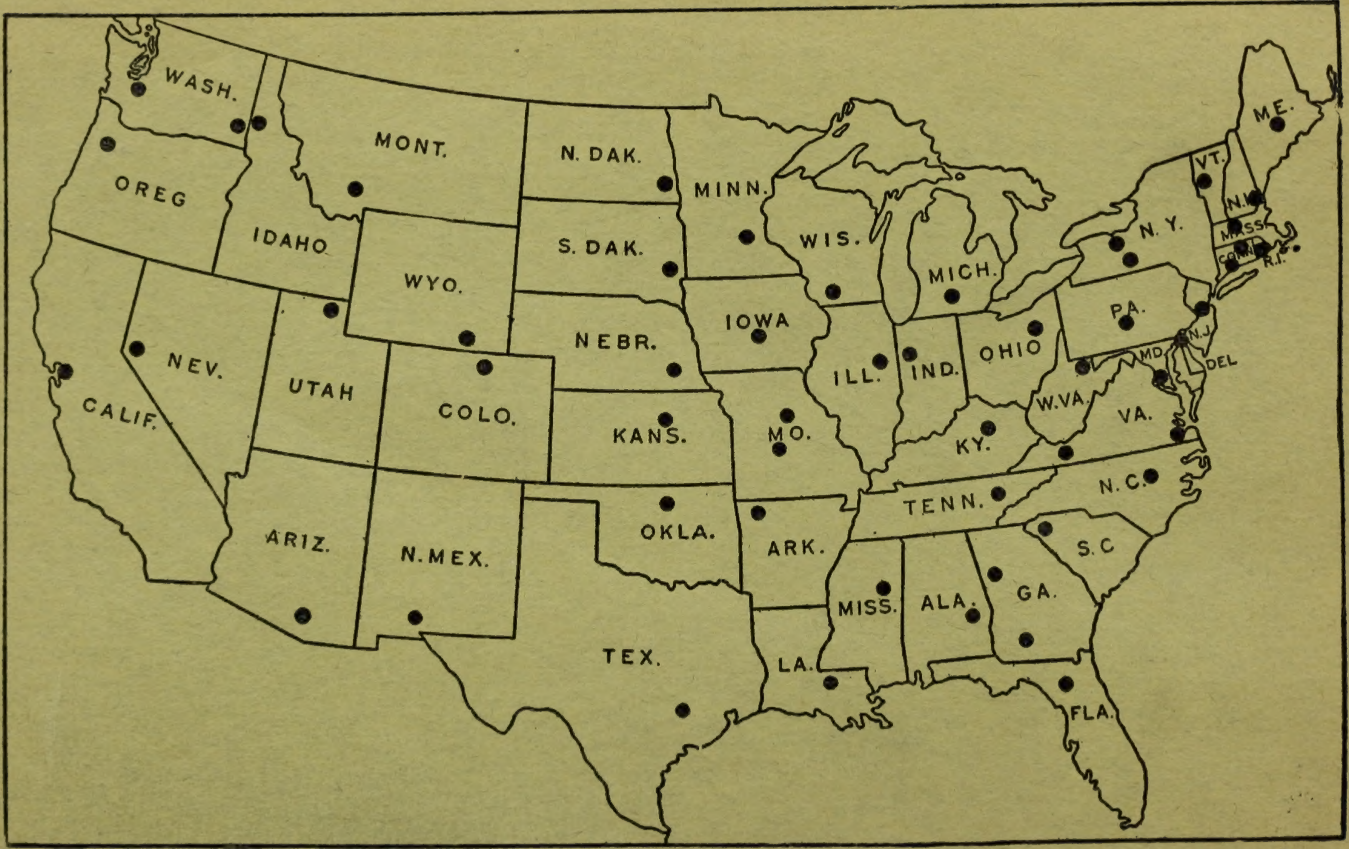

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CLASSIFICATION OF THE DERMESTIDAE (LARDER, HIDE, AND CARPET BEETLES) BASED ON LARVAL CHARACTERS, WITH A KEY TO THE NORTH AMERICAN GENERA

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INTRODUCTION

The economic importance of the Dermestidae has long been recognized by entomologists. In the larval stages its members feed upon, damage, or destroy household furnishings, a large variety of goods made of leather, hair, fur, wool, and silk, dried animal remains, museum specimens and exhibits, and insect collections. The larvae are also destructive to stored products of many kinds, including bacon, cheese, cork, seeds, cereals, and cereal products, and they have been known to damage telephone fuses and batteries containing lead. In rare instances the larvae of *Attagenus piceus* (Oliv.) have caused physical discomfort to human beings by their presence in the nasal passages and sinuses. At one time in London the larvae of *Dermestes vulpinus* F. so injured skins and furs stored in warehouses that a reward of £2,000 was offered for an effective means of destroying them. Robinson (*11*)[1] summarizes additional accounts regarding the damage and consequent losses due to the ravages of this insect, and there are numerous similar records dealing with injuries caused by other species of this family. In wartime the importance of these insects is increased, since large military stores, such as those of uniforms, blankets, leather articles, dried meats, cheeses, and other foodstuffs, must be protected from their attacks.

With the Dermestidae, as with many other economically important families, the greatest damage occurs while the beetles are in the larval stage, and it is, therefore, in this stage that they are most frequently encountered. As the life histories and habits of the various species differ significantly, correct identification is essential as a foundation for control procedure. Until recently, no general study of dermestid larvae had been made. Numerous descriptions and illustrations of different larvae appear throughout the literature on this family, but they are so fragmentary, or general and lacking in detail, as to be of little use for the purpose of specific identification and, in many instances, even for generic determination. Occasionally papers have been published in which the larvae of two or more species, usually of different genera, were compared, and from these comparisons attempts have been made to show the relationships of the groups concerned.

Although some success in determining group relationship has been attained by such piecemeal work, a thorough investigation of additional material of many genera must be made before it can be demonstrated satisfactorily whether the relationships revealed by the study of the larvae agree with those disclosed by work on the adults. Unfortunately, representative larvae of all genera have not yet been collected, and for those groups in which collections have been made specimens are not always obtainable. Owing to these facts, it is necessary to limit the present work to those groups in which material is available and which, with a few exceptions, are found in North America.

The present investigation is based on material in the collection of the United States National Museum, including a considerable number of specimens collected and reared by the writer in the course of the work, supplemented by certain valuable material made available by Clarence E. Mickel, of the University of Minnesota, and Marion E. Smith, of Massachusetts State College. Although some genera of the family are represented in the available material by only a few specimens of a single species, examples of all genera listed by Leng (*6*), with the exception of *Dearthrus* Lec., *Orphilus* Er., and *Acolpus* Jayne, have been studied. In cases where little material was procurable, characters corresponding to those found to be significant and constant in well-represented genera were selected and utilized.

As catalogued by Leng, the family Dermestidae is represented in North America by 13 genera (exclusive of *Byturus*). From a study of the larvae and adults of *Perimegatoma vespulae* Milliron, the present writer is inclined to agree with Milliron (*8*) who stated concerning this species: "The distinct characters which it shows might justify erecting a new genus for its reception * * *" Larval specimens are available and the species may again be encountered in the field, therefore it is considered in the present work. Also included are a few exotic species contained in the larval collection of the United States National Museum.

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[1] Italic numbers in parentheses refer to Literature Cited, p. 13.

The identifications of the species studied were checked as closely as possible, and only larvae definitely associated with adults or from which adults were reared were used. The identifications of the reared material and associated adults were made or rechecked by H. S. Barber, Division of Insect Identification, Bureau of Entomology and Plant Quarantine.

SUBFAMILY AND GENERIC RELATIONSHIPS

Various classifications of the Dermestidae have been presented by different students of this family, some working on the adult insects, others on the larvae. If a fundamentally sound classification of the family is to be developed it is apparent that careful consideration should be given to evidence derived from studies of both adult and immature stages, and the possibility of a reclassification should be considered whenever differences are encountered.

According to Böving and Craighead (*1*), the family Dermestidae contains two subfamilies—Dermestinae, composed only of the genus *Dermestes* L., and Attageninae, which includes Thylodriinae, Attagenini, Megatomini, Anthrenini, Trinodini, and Orphilini, as catalogued by Leng. This classification is based on the presence or absence of the urogomphi, the presence or absence of a stiff process (retinaculum) and a basal setal brush on the mandible, and whether the submentum and gula are fused. By retaining some of these characters and introducing others, such as the differences in the disposition of the pubescence, the ornamentation of the epipharynx, and the number of segments of the different appendages, Lepesme and Paulian (*7*) maintain that the subfamily Attageninae of Böving and Craighead groups together heterogeneous forms. They, therefore, propose to classify the Dermestidae into five subfamilies: Dermestinae, Thylodriinae, Trinodinae, Attageninae, and Anthreninae, the last of which comprises the two tribes Anthrenini and Megatomini.

Although the classification presented in this paper agrees somewhat with that proposed by Lepesme and Paulian, it was not reached in the same manner, new characters and different interpretations of characters being followed. With the exception of the Orphilini of Leng, the larvae of which were not available for study, the classification is based on larval characters considered distinctive enough to separate the members of this family into the following groups: Dermestinae, Attageninae, Trinodinae, Thylodriinae, and Anthreninae, the last of which consists of the tribes Megatomini, Anthrenini, and, as proposed in this paper, Ctesiini.

The subfamily Dermestinae (fig. 1, *A*; see p. 14) is formed by the single genus *Dermestes*, the larvae of which possess a pair of urogomphi on the ninth abdominal segment (fig. 2, *H*), a sclerotized and pigmented ring completely encircling the tenth segment, the use of this segment as a pygopod, long, coarse, spinulate setae some of which are in eight oblique series arranged transversally across the abdominal tergites (fig. 3, *I*), retrorse tubercles in the last larval stage of most species (fig. 3, *I*), and a tridentate mandible (fig. 2, *A*) with a strong retinaculum and basal setal brush. These characters differentiate the members of this group into a distinct unit.

The subfamily Trinodinae (fig. 1, *E*) is represented in North Amer-America by the genera *Attagenus* Latr., *Dearthrus* Lec., and *Novelsis* Csy. Although the members of this group possess some characters similar to those found in the Dermestinae, such as the general shape of the body, the possession of a retinaculum and a basal setal brush on the mandible (fig. 2, *B*), and others, they are excluded from the latter group because they lack urogomphi, have distally rounded instead of tridentate mandibles, do not have the tenth abdominal segment completely encircled by a pigmented sclerotized ring, and do not use this segment as a pygopod. Furthermore, the members of this group possess a caudal brush (fig. 2, *I* and *J*) composed of long, slender setae, and the pubescence of the body (fig. 3, *G* and *H*) and the relative lengths of the segments of the maxillary palpus (fig. 3, *B*) are unlike those found in the Dermestinae or any other group.

The subfamily Trinodinae (fig. 1, *E*) is represented in North America by the single species *Apsectus hispidus* (Melsh.). The study of its larva reveals characters which indicate a group relationship different from that noted heretofore. Unfortunately, only specimens of *A. hispidus* were available for study, although other genera are assigned to this group. If the larva of this species is representative of the subfamily, as it appears to be from a study of the literature, the larvae of this group are characterized by an ornamentation of the epipharynx (fig. 4, *C*) similar to that found in the Dermestinae, Attageninae, and Thylodriinae, a four-segmented maxillary palpus (fig. 3, *C*), a pointed and toothed mandible without a retinaculum or basal setal brush (fig. 2, *C* and *D*), and the arrangement of the setae in distinct, clear, transverse areas on the tergites. They lack the caudal brush and urogomphi. It would appear that the subfamily should be placed near other units possessing the first two characters mentioned and not be separated from them, as is generally done, by a group with a different ornamentation of the epipharynx (fig. 4, *F*) and with a three-segmented maxillary palpus (fig. 3, *E*). In addition, *A. hispidus* and *Thylodrias contractus* Mots. exhibit a similarity of the maxillary palpus, the ligula, and the antenna, and they have the same number of proximal sensory papillae on the epipharynx. Apparently the group should be placed near the Dermestinae, Attageninae, and Thylodriinae.

The subfamily Thylodriinae (fig. 1, *F*) contains the single species *Thylodrias contractus* [2]—which, because of its distinctive characters, both in the larvae and the adults, is set off from all other groups.

The subfamily Anthreninae (fig. 1, *C* and *D*) is composed of the tribes Megatomini, Anthrenini, and Ctesiini, the members of which are characterized by the possession of hastisetae [3] (fig. 3, *F*) and has-

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[2] Although there has been some doubt as to the systematic position of this species, a study of the larva reveals that it meets all the characteristic requirements of the Dermestidae. The species should, therefore, be retained in this family.

[3] In regard to these setae, peculiar to some dermestid larvae, Ferris (*4*) states: "The type is so distinct that it deserves a special name. * * * I have been unable to hit upon anything better than to characterize it as 'pendicle setae,' the word pendicle, according to the dictionary, being sometimes used to mean 'a pendant ornament.' " However, the setae seem to be more than ornamental and the term "hastiseta" (*hasta*, spear, and *seta*, hair or bristle) is more descriptive for these structures which sometimes have been called "spear setae."

tisetal tufts, an ornamentation of the epipharynx different from that found in the previously discussed groups, and a three-segmented maxillary palpus (fig. 3, *E*). The tribe Megatomini (fig. 1, *D*) is composed of the genera whose members are elongate and fusiform, typically with the greatest width of the body through the thorax (preserved specimens sometimes have the abdomen distended, giving the greatest width through the abdomen). In these larvae the tergites never curve anterolaterally about the bases of the hastisetal tufts but have the setae arising from the tergites. The tribe Anthrenini (fig. 1, *C*) is composed of the single genus *Anthrenus* F., whose members are compact and oval, typically with the greatest width of the body through abdominal segments 2 to 5. The tribe Ctesiini, so far as known, consists of the single species *Ctesias serra* (F.), the larva of which is distinguished by the suboblong shape of the body, the short and narrow abdominal segments 1 to 3 forming a constriction of the body at this point, and the long pronotum, which is about as long as the combined lengths of the mesonotum and metanotum.

Lepesme and Paulian (*7*) propose the separation of the Anthreninae into two tribes, Megatomini and Anthrenini, but it is difficult to find some one character which will differentiate the Megatomini in its entirety from the Anthrenini if the species *Ctesias serra* is retained in the former tribe. Those authors characterize the Megatomini by the presence of two longitudinal rods (epipharyngeal rods) on the epipharynx and the presence of a long setal brush (caudal brush) at the apex of the abdomen. According to them, the Anthrenini lack these characters. Both structures, however, are present in the genus *Anthrenus*, which constitutes the latter tribe. The epipharyngeal rods occur in all species, and the caudal brush in the *verbasci*-type larvae is composed of a few, fairly long, usually inwardly curving setae, except in the earlier stages, where the brush is long and whorled, whereas in the *scrophulariae*-type larvae the caudal brush is distinct, long, and straight, and sometimes somewhat hidden by the long lateral setae of the posterior abdominal segments.

Larsson (*5*) more nearly approaches a satisfactory distinction of the two groups by characterizing the Megatomini as having the greatest width of the body through the thorax and the Anthrenini by having the greatest width through abdominal segments 2 to 5. However, a study of preserved larvae of *Ctesias serra* reveals that the width through the fourth abdominal segment is equal to the greatest width through the thorax. Also, the larva is somewhat compact and similar to larvae of the genus *Anthrenus*. Nevertheless, as shown by the characters previously given, the larva of *C. serra* is distinct from the larvae of the species constituting either Megatomini or Anthrenini.

CONSIDERATION OF THE GENERA OF ANTHRENINAE

A study of the larvae of *Entomotrogus megatomoides* Reitt., *Eucnocerus anthrenoides* Sharp, and several species of *Trogoderma* Latr. revealed no characters by which the three genera could be separated. On the other hand, they agree in all constant characters, indicating the probability that the species of *Entomotrogus* Ganglb., *Eucnocerus* Sharp, and *Trogoderma* may be congeneric. Lepesme and Paulian, however, differentiate *Entomotrogus* from *Trogoderma* by the relative lengths of the second and last antennal segments, a character which did not prove reliable in a study of several species of *Trogoderma* examined in the present study.

The characters of the larvae of *Perimegatoma vespulae* agree for the most part with those possessed by the larvae of *Trogoderma*, but they differ in the maximum number of proximal sensory cups on the epipharynx. Although an examination of the larvae revealed characters similar to those found in *Trogoderma*, some students of the adults believe this species should be placed near *Megatoma* Hbst., the larvae of which were not available for study and comparison.

The genus *Labrocerus* Sharp is classified by Dalla Torre (*2*) in his Attageninae, but the larvae have structures characteristic of the Anthreninae. Furthermore, larvae of this genus from Hawaii possess characters similar to those of the genera *Thaumaglossa* Redt. and *Cryptorhopalum* Guér. The larvae of *Perimegatoma* Horn, retaining the principal characters of the Megatomini, have on the epipharynx a medianly located, loosely grouped set of sensory papillae in which the papillae are distinctly separated from one another, a character found in the genus *Anthrenus*.

TAXONOMIC TREATMENT OF THE FAMILY

Family Characters

The following characters will serve to distinguish the dermestid larvae from those of other coleopterous families:

Body densely covered with long or short spinulate setae, sometimes with hastisetae; head hypognathous and subglobular; epicranial and frontal sutures present; frons triangular; antennae three-segmented, second segment with an accessory papilla; legs five-segmented, with tarsus and claw fused into a single claw-shaped, terminal tarsungular segment; urogomphi usually absent, when present solid; gula present; maxillary articulating areas small, not large and cushioned; labrum anteriorly emarginate, laterally rounded; labro-epipharyngeal margin with series of setae, setae progressively larger and broader from lateral margins to middle, middle setae similar or dissimilar to lateral setal series; mandible distally rounded, sometimes dentate or pointed, with or without retinaculum and basal setal brush; maxillary palpus 3- or 4-segmented; galea simple, setiferous; lacinia distally armed with one or more long, strong, slightly curved, sclerotized and pigmented spurs; labial palpus two-segmented; ligula bilobed.

Key to the Subfamilies and Genera [4]

1. Urogomphi present (fig. 2, *H*); tenth abdominal segment completely encircled by a sclerotized ring ------ Dermestinae (*Dermestes*), p. 8.
   Urogomphi absent; tenth abdominal segment not completely encircled by a sclerotized ring -- 2

2. Body with hastisetae (see footnote 3, p. 4 and fig. 3, *F*) and hastisetal tufts; epipharynx with distal sensory papillae, a median pair, and a proximal transverse series of sensory cups (figs. 4, *E* and *F*; 5, *D* and *F*) ------------------------------------ Anthreninae, pp. 10–13.
   Body without hastisetae and hastisetal tufts; ornamentation of epipharynx otherwise (fig. 4, *A*, *B*, *C*, and *D*) ------------------------ 3

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[4] As it is desirable to make the key applicable to the exuviae, which may become distended as well as to the larvae, key characters to the tribes are not given.

3. Caudal brush of long setae present (fig. 2, *I* and *J*); antennae (fig. 2, *L*) long; body elongate, sclerotized dorsally and ventrally---------- Attageninae, pp. 8–9.
   Caudal brush absent; antenna (fig. 2, *M* and *N*) short; body oval or oblong, sclerotized dorsally, membranous ventrally---------- 4
4. Each tergite (fig. 3, *K*) with a comblike series of coarse, spinulate, clavate setae posteriorly; setae short; 3 large subequal ocelli on each side of head------ Thylodriinae (*Thylodrias contractus* Mots.), p. 10.
   Tergites (fig. 3, *J*) without comblike series of clavate setae; setae very long, arising from clear areas of the tergites; pigmentation pattern at midline broadly sagittate; 6 ocelli on each side of head, in 2 groups of 3 each---------- Trinodinae (*Aspectus hispidus* (Melsh.)), p. 9.
5. Body setae (fig. 3, *G*) brownish yellow to yellowish brown, faintly ridged; ninth tergite (fig. 2, *I*) at least one-half as long as eighth, gradually arched longitudinally; setae of caudal brush numerous, arising at random on the ninth tergite---------- *Attagenus*, p. 9.
   Body setae (fig. 3, *H*) except caudal brush and sometimes on head, brownish black to jet black, strongly ridged; ninth tergite (fig. 2, *J*) not more than one-third as long as eighth, sharply arched longitudinally; setae of caudal brush about 20, arising in 2 compact groups of about 10 setae each from the almost perpendicular posterior area of the segment---------- *Novelsis*, p. 9.
6. Distal sensory papillae of epipharynx (figs. 4, *F*, and 5, *C*) in one or more sharply defined, compact groups; second antennal segment subequal to first or longer (fig. 2, *P*), rarely twice as long as first------ 9
   Distal sensory papillae of epipharynx (fig. 5, *E* and *F*) loosely grouped, distinctly and widely separated, large to minute; second antennal segment (fig. 2, *O*, *Q*, *R*, and *S*) never less than twice as long as first--- 7
7. Distal sensory papillae (fig. 5, *F*) near distal margin of epipharynx, large, typically 6, in 2 longitudinal series of 3 each-- *Ctesias* (*C. serra* (F.)), pp. 12–13.
   Distal sensory papillae (figs. 4, *E*, and 5, *E*) nearer middle of epipharynx, medium to minute, in a faintly defined, fusiform area---------- 8
8. Middle setal series of labro-epipharyngeal margin (fig. 5, *E*) with broad and slender setae, typically with 2 broad inner setae and 2 slender outer setae (proximal sensory cups of epipharynx about 12)---------- *Anthrenus*, p. 12.
   Middle setal series on labro-epipharyngeal margin (fig. 4, *E*) with broad setae only, typically 4 (proximal sensory cups of epipharynx about 9)---------- *Perimegatoma*, p. 11.
9. Frons with a single medio-anterior tubercle; distal sensory papillae of epipharynx typically in 2 or more sharply defined, compact groups---- 13
   Frons without tubercle; distal sensory papillae of epipharynx in a single, sharply defined, compact group---------- 10
10. Middle setal series of labro-epipharyngeal margin (fig. 5, *A* and *B*) with slender setae only, sometimes lacking---------- 12
    Middle setal series otherwise (fig. 4, *F*)---------- 11
11. Epipharynx (fig. 4, *F*), with proximal transverse series of 10 to 20 sensory cups---------- *Trogoderma*, p. 11.
    Epipharynx with proximal transverse series of about 7 to 8, never more than 9, sensory cups---- unnamed genus based on *Perimegatoma vespulae* Milliron, p. 11.
12. Epipharyngeal rods (fig. 5, *A*) slender, curved; epipharynx with proximal transverse series of 8, or less, sensory cups (tergites at midline with very long, spinulate setae in addition to shorter, normal, spinulate setae and hastisetae)-- *Thaumaglossa* (*T. americana* Jayne), p. 11.
    Epipharyngeal rods (fig. 5, *B*) broad; epipharynx with proximal transverse series of more than 8, usually 13, sensory cups (tergites at midline normal)----- *Cryptorhopalum* (*C. dubium* Sharp), p. 11.
13. Epipharynx (fig. 5, *C*) with proximal transverse series of 12 or less, usually 8, sensory cups (lateral setae of labro-epipharyngeal margin about 8)---- *Globicornis* (*G.* sp., probably *fulvipes* Guérin), pp. 11–12.
    Epipharynx (fig. 5, *D*) with proximal transverse series of more than 12, usually 16, sensory cups (lateral setae of labro-epipharyngeal margin about 13)---------- *Labrocerus* (*L. simplex* Sharp), p. 12.

DERMESTINAE

Represented by the single genus *Dermestes* Linné.

Body elongate, tapering anteriorly and posteriorly from metathorax; dorsally deep reddish brown, with or without broad light line down back, strongly sclerotized; ventrally white, membranous except for 4 posterior abdominal segments which are nearly or completely sclerotized and pigmented; clothed with short to very long spinulate setae, some of which are in 8 distinct, oblique series across terga (fig. 3, *I*); most species in last larval stage with tergites 4 to 9, sometimes 3 to 10, each bearing an anterior transverse series of retrorse tubercles; ninth abdominal segment with a pair of urogomphi (fig. 2, *H*); tenth segment completely encircled by a pigmented sclerotized ring. Spiracles well developed, pigmented, and sclerotized; mesothoracic spiracle within membrane; metathoracic spiracle greatly reduced, nonfunctional, indicated by small pigmented sclerite in membrane, abdominal spiracles in membrane or within respective tergites. Legs unevenly pigmented. Head coriaceous, with fine slender setae, lightly pigmented around ocelli; 6 ocelli on each side; frons with or without a pair of tubercles; antenna (fig. 2, *K*) long, sensory organ near middle of second segment. Labrum with few setae. Epipharynx (fig. 4, *A*) with proximal sensory area composed of a transverse, sometimes slightly irregular series of 6 large sensory papillae and a slightly more proximal transverse series of about 9 to 11 sensory cups; epipharyngeal rods tapering posteriorly, curved and diverging lateroposteriorly. Mandible (fig. 2, *A*) piceous, tridentate, with large retinaculum and basal setal brush of long stiff setae; maxillary palpus (fig. 3, *A*) 4-segmented, segments subequal; palpiger well sclerotized; ligula bilobed, setiferous; gula and submentum fused.

Böving and Craighead (*1*) and Lepesme and Paulian (*7*) illustrate the sensory papillae and cups of the epipharynx as being distributed without order. Robinson (*11*) illustrates these structures as being in orderly transverse series but describes all the components as tiny cuplike depressions, stating that they correspond in their structure and location on the epipharynx to the taste cups described by Packard (*10*).

ATTAGENINAE

Represented in North America by the genera *Attagenus*, *Novelsis*, and *Dearthrus*.

Body elongate, gradually tapering anteriorly and posteriorly from metathorax, rounded dorsally, flattened ventrally, strongly sclerotized; sclerites golden to fairly dark brown, venter lighter in color than dorsum; generally densely covered with golden-brown to jet-black setae of various shapes (fig. 3, *G* and *H*), a transverse series of similar but longer setae at posterior margin of each segment, the setae forming a loose bundle at lateral margin of each thoracic tergite; a small sclerite bearing several long, slender setae at lateroposterior angle of each abdominal tergite; setae of body for most part directed posteriorly; ninth segment with a long caudal brush (fig. 2, *I* and *J*); tenth segment small, white, membranous, usually with 2 ventral oblong sclerites. Spiracles small, inconspicuous, at lateroposterior angles of tergites. Legs stout. Head densely covered with recumbent setae; antenna long (fig. 2, *L*), segments 1 and 2 very long, 3 short. Labrum dorsally with numerous long setae. Epipharynx (fig. 4, *B*) with proximal sensory area composed of a transverse, sometimes slightly irregular series of 6 large sensory papillae and a slightly more proximal transverse series of about 17 to 20 sensory cups. Mandible (fig. 2, *B*) distally rounded, distal half piceous and distinctly narrower than yellowish-brown basal half, retinaculum and basal setal brush present; maxillary palpus (fig. 3, *B*) 4-segmented, first and second segments small, third curved inwardly and long, longer than 1 and 2 combined, fourth shorter than third; segments of labial palpus subequal; ligula bilobed, setiferous; gula and submentum not fused.

Böving and Craighead (*1*) do not illustrate or indicate the presence of the retinaculum or basal setal brush on the mandible of

Attagenus piceus (Oliv.). Lepesme and Paulian (*7*) state that the posterior transverse series of sensory cups, present in the Anthreminae, is lacking in Attageninae. In their illustration of the epipharynx of *A. pellio* (L.), however, they show two curving, dotted, parallel lines in the approximate position of the posterior sensory cups. The sensory cups assume this appearance to some extent when the epipharynx is distorted and the cups are seen in a side view.

Genus ATTAGENUS Latreille

Setae (fig. 3, *G*) brownish yellow to yellowish brown, faintly ridged longitudinally, lanceolate to elongate-lanceolate; setae of caudal brush (fig. 2, *I*) numerous, arising at random on dorsum of ninth segment. Ninth segment not telescoped into eighth; dorsum gradually arched longitudinally; ninth tergite at least one-half as long as eighth. Ocelli small, 5 on each side of head.

Genus NOVELSIS Casey

Setae (fig. 3, *H*) brownish black to jet black, finely to coarsely spinulate and longitudinally ridged, of various shapes and sizes, lanceolate to acutely oval, caudal brush and setae of head sometimes brownish yellow to yellowish brown; setae of caudal brush (fig. 2, *J*) long, about 20 in number, arising from the almost vertical, posterior, membranous area of the ninth segment in 2 compact dorsolateral groups of about 10 setae each, groups narrowly separated at midline. Ninth segment telescoped into eighth; dorsum sharply arched longitudinally, posteriorly truncate; ninth tergite not more than one-third the length of eighth. Ocelli large, 4 on each side of head.

TRINODINAE

Represented in North America by the single species *Apsectus hispidus* (Melsh.).

Body elongate oval; dorsally sclerotized and with distinct pigmentation pattern, brown to smoky, with very long, coarse, spinulate setae, thoracic venter white, mebranous, a brush of coarse setae between coxae of each pair of legs, abdominal sternites weakly sclerotized, light brownish yellow, setiferous; pronotum with setae arising from 4 clear, transverse areas, 1 on each side of midline near anterior margin, 2 similarly located near posterior margin; mesonotum, metanotum, and abdominal tergites 1 to 7 (fig. 3, *J*) with pigmentation broadly sagittate at midline, setae arising from a clear, transverse, somewhat posterior area on each side of midline; segments 8 and 9 with similar setae but pigmentation pattern indistinct or lacking; tenth abdominal segment entirely membranous and white. Spiracles in membrane, small and inconspicuous. Legs long and slender, coxae and femora with longitudinal series of coarse setae; tibio-tarsi densely setiferous. Head yellowish brown, with a few fine, short setae; 6 ocelli on each side in 2 groups of 3 each; antenna (fig. 2, *M*) short, accessory papilla nearly as long as third segment, setae of first segment long. Labrum with many long setae. Labro-epipharyngeal margin (fig. 4, *C*) with a series of about 5 oval setae on each side, setae progressively larger toward middle. Epipharynx (fig. 4, *C*) with proximal sensory area composed of a transverse series of 4 sensory papillae and a slightly more proximal series of about 14 sensory cups; epipharyngeal rods broad, tapering posteriorly, curved and diverging lateroposteriorly. Mandible (fig. 2, *C* and *D*) distally piceous and pointed, toothed along inner dorsal cutting edge, basal half brownish yellow, retinaculum and basal setal brush lacking; maxillary palpus (fig. 3, *C*) 4-segmented, apical segment as long as 2 and 3 combined; segments of labial palpus subequal; lobes of ligula asperate.

Böving and Craighead (*1*) illustrate the maxillary palpus of *Apsectus hispidus* as having three segments. Mulsant and Rey (*9*) describe the maxillary palpus of *Trinodes hirtus* (F.) as being three-segmented, while Donisthorpe (*3*) illustrates it as four-segmented.

THYLODRIINAE

Represented by the single species *Thylodrias contractus* Mots.

Body oblong; dorsally reddish brown and strongly sclerotized, ventrally white and membranous; densely covered with short, subequal, spinulate setae; thoracic tergites and abdominal tergites 1 to 7 (fig. 3, *K*) each with 2 transverse rows of setae along posterior margin, the posterior row composed of slender, pale, pointed setae, the other of darker, thick, clavate setae, the latter row forming a pronounced comblike series and somewhat covering the first row; tergites anteriorly with numerous slender, pale, recumbent setae arising at random and directed mesally; tergites laterally, except pronotum, rounded, bearing on each lateral margin a tuft of stout, dark, pointed setae; lateral and anterior marginal pubescence of pronotum very dense; eighth and ninth tergites similar to others but with dense transverse series of stout, pointed setae along posterior margins; tenth abdominal segment small, entirely membranous. Spiracles in membrane, small and inconspicuous. Legs long and slender. Head reddish brown, setiferous; 3 ocelli on each side; antenna (fig. 2, *N*) short, accessory papillae nearly as long as third segment, setae of first segment numerous, extending beyond and concealing terminal segments. Labrum setiferous. Labro-epipharyngeal margin (fig. 4, ***D***) with setae of middle series broad, shorter than setae of lateral series, sometimes distally emarginate. Epipharynx (fig. 4, ***D***) with proximal sensory area composed of a transverse series of 4 large papillae and a slightly more proximal transverse series of about 20 to 24 sensory cups; epipharyngeal rods pigmented, curved and diverging lateroposteriorly. Mandible (fig. 2, *E* and *F*) distally piceous and rounded, distinctly narrower than yellowish-brown basal half, inner dorsal cutting edge rounded, retinaculum and basal setal brush absent; maxillary palpus (fig. 3, *D*) 4-segmented, apical segment slightly longer than the other 3 combined; last segment of labial palpus longer than first; gula and submentum not fused.

Lepesme and Paulian (*7*) were not able to study larval specimens of *Thylodrias contractus* and had to rely for characters upon their interpretations of the illustrations of this species presented by Böving and Craighead (*1*). They interpreted the antenna to be biarticulate and the head to possess 5 ocelli on each side. Böving and Craighead (*1*) illustrate the maxillary palpus of this species as being 3-segmented and do not indicate the posterior sensory papillae or sensory cups of the epipharynx. They also represent the anterior area of each tergite, except the pronotum, as bearing a single transverse series of fine setae.

ANTHRENINAE

Represented in North America by the genera *Perimegatoma*, *Trogoderma*, *Acolpus*, *Thaumaglossa*, *Cryptorhopalum*, and *Anthrenus*.

Body fusiform, oval, or suboblong; dorsally sclerotized and pigmented, ventrally less so; clothed with long or short spinulate setae and hastisetae (fig. 3, *F*); last abdominal segments with hastisetal tufts; ninth abdominal segment with caudal brush composed usually of many long setae but sometimes of fewer somewhat shorter and curved, setae; tenth abdominal segment small, white, membranous. Six ocelli on each side of head. Epipharynx (figs. 4, *E* and *F*; 5, *A*–*F*) with distal sensory papillae, normally 6; a medium pair of sensory cups; a proximal transverse series of sensory cups; a pair of epipharyngeal rods. Mandible (fig. 2, *G*) distally rounded and piceous, basally yellowish brown, retinaculum present or absent, basal setal brush absent; maxillary palpus (fig. 3, *E*) 3-segmented.

MEGATOMINI

Body elongate, fusiform, not compact, typically with greatest width through the thorax, hastisetae arising from tergites, tergites never curved about bases of hastisetal tufts.

Genus PERIMEGATOMA Horn

Hastisetal tufts short, compact, progressively larger and denser posteriorly in larvae of the late stages, somewhat more distinctly prominent on segments 5 to 8 in larvae of the early stages. Antenna (fig. 2, *O*) long, second segment more than twice as long as first. Middle setal series of labro-epipharyngeal margin (fig. 4, *E*) with broad setae only, typically 4, sometimes 5. Epipharynx (fig. 4, *E*) with distal sensory papillae loosely grouped in a faintly defined, transverse, fusiform area near middle of epipharynx, papillae medium to minute in size, distinctly and widely separated; a median pair of sensory cups; a proximal transverse series of about 9 sensory cups; epipharyngeal rods fairly broad, nearly straight, diverging lateroposteriorly. Mandible rounded, inner cutting edge rounded; retinaculum present.

Genus TROGODERMA Latreille

Hastisetal tufts short, compact, progressively larger and denser posteriorly in larvae of the late stages, typically prominent on segments 5 to 8 in larvae of the early stages. Antenna (fig. 2, *P*) short, second segment subequal to first, rarely twice as long. Middle setal series of labro-epipharyngeal margin (fig. 4, *F*) with broad and slender setae, typically 2 broad inner and 2 slender outer setae, or with broad setae only. Epipharynx (fig. 4, *F*) with distal sensory papillae in a single, sharply defined, compact group near distal margin of epipharynx; a median pair of sensory cups; a proximal transverse series of 10 to 20 sensory cups; epipharyngeal rods slender, tapering posteriorly, diverging lateroposteriorly. Mandible (fig. 2, *G*) distally rounded, inner cutting edges rounded; retinaculum present.

Genus Unnamed

([*Perimegatoma*] *vespulae* Milliron)

Agrees with all characters given for *Trogoderma*, except that the sensory cups of the proximal transverse series number about 8, never 10 or more.

Genus THAUMAGLOSSA Redtenbacher

(*T. americana* Jayne)

Tergites at midline with very long spinulate setae, in addition to shorter normal spinulate setae and hastisetae; hastisetal tufts progressively larger and denser posteriorly. Antenna short. Middle setal series of labro-epipharyngeal margin (fig. 5, *A*) with slender setae only, typically 4. Epipharynx (fig. 5, *A*) with distal sensory papillae in a single, sharply defined, compact group near distal margin of epipharynx; a median pair of sensory cups; a proximal transverse series of about 6 sensory cups; epipharyngeal rods slender, curved, and diverging lateroposteriorly. Mandible distally rounded, inner cutting edges rounded; without retinaculum.

Genus CRYPTORHOPALUM Guérin

(*C. dubium* Sharp)

Hastisetal tufts on seventh segment only, prominent, long, dense, directed posteriorly. Antenna short. Middle setal series of labro-epipharyngeal margin (fig. 5, *B*) with slender setae only, and these sometimes lacking. Epipharynx (fig. 5, *B*) with distal sensory papillae in a single, sharply defined, compact group near distal margin of epipharynx; a median pair of sensory cups; a proximal transverse series of about 14 sensory cups; epipharyngeal rods broad, anterior two-thirds straight and parallel, posterior third abruptly tapering and diverging lateroposteriorly. Mandible distally rounded, with a sharp tooth on each inner cutting edge; retinaculum present.

Genus GLOBICORNIS Latreille

(*G.* prob. *fulvipes* Guér.)

Hastisetal tufts on segments 7 and 8, prominent, long, dense, directed posteriorly. Frons with a single medioanterior tubercle. Antenna short. Middle setal series of labro-epipharyngeal margin (fig. 5, *C*) with slender setae only, typically 4. Epipharynx (fig. 5, *C*) with distal sensory papillae in 1 or more, usually 2, sharply defined, compact groups near distal margin of epipharynx; a median pair of sensory cups; a proximal transverse series of about 8 sensory cups; epipharyngeal rods fairly broad, anterior two-thirds straight and parallel, posterior third abruptly tapering and diverging lateroposteriorly. Mandible distally rounded, with a fairly sharp tooth on each inner cutting edge; retinaculum present.

Genus LABROCERUS Sharp

(*L. simplex* Sharp)

Hastisetal tufts on segments 7 and 8, prominent, long, dense, directed posteriorly. Frons with a single medioanterior tubercle. Antenna short. Middle setal series of labro-epipharyngeal margin (fig. 5, *D*) with slender setae only, sometimes lacking. Epipharynx (fig. 5, *D*) with distal papillae in 1 or more, usually 2 or 3, sharply defined, compact groups near distal margin of epipharynx; a median pair of sensory cups; a proximal transverse series of about 16 sensory cups; epipharyngeal rods broad, anterior two-thirds straight and parallel, posterior third abruptly tapering and diverging lateroposteriorly. Mandible distally rounded, with a sharp tooth on each inner cutting edge; retinaculum present.

ANTHRENINI

Body oval, compact, not constricted, greatest width at abdominal segments 2 to 5; terminal abdominal segments appearing somewhat telescoped, sides of body abruptly converging posteriorly from fifth abdominal segment; pronotum normal, short.

Genus ANTHRENUS Fabricius

Hastisetal tufts on segments 5 to 7, prominent, long, dense, directed posteriorly; corresponding tergites curved anterolaterally about bases of tufts. Antenna (fig. 2, *Q* and *R*) long, second segment 2½ to 5 times as long as first. Middle setal series of labro-epipharyngeal margin (fig. 5, *E*) with broad and slender setae, typically 2 broad inner, and 2 slender outer setae. Epipharynx (fig. 5, *E*) with distal sensory papillae loosely grouped in a faintly defined, transverse, fusiform area near middle of epipharynx, papillae medium to minute in size, distinctly and widely separated; a medium pair of sensory cups; a proximal transverse series of about 8 to 12 sensory cups; epipharyngeal rods fairly broad to slender, slightly curved and diverging lateroposteriorly. Mandible distally rounded, inner cutting edges rounded; with or without retinaculum.

CTESIINI, new tribe

Body compact, suboblong, constricted at abdominal segments 1 to 3, greatest width of abdomen equal to or subequal to greatest width through thorax; pronotum long, about equal to the combined lengths of the mesonotum and metanotum.

Genus CTESIAS Stephens

(*C. serra* (*F.*))

Body suboblong, compact, width of fourth abdominal segment equal to, or subequal to, greatest width of thorax, abdominal segments 1 to 3 short, narrow, forming constriction of body; length of pronotum about equal to combined lengths of mesonotum and metanotum. Tergites strongly sclerotized and pigmented; abdominal segments ventrally with small, well-sclerotized, pigmented, rectangular sclerites. Hastisetal tufts 4 to 7, prominent, long, dense, directed posteriorly, corresponding tergites curved anterolaterally about bases of tufts, third segment with shorter, less dense tufts, tufts progressively larger and denser posteriorly. Antenna (fig. 2, *S*) long, second segment about 3 times as long as first. Middle setal series of labro-epipharyngeal margin (fig. 5, *F*) with broad and slender setae, typically 2 broad inner and 2 slender outer setae. Epipharynx (fig. 5, *F*) with distal papillae in 2 longitudinal series of 3 papillae each near distal margin of epipharynx, papillae large, distinctly and widely separated; a median pair of sensory cups; a proximal transverse series of about 10 sensory cups; epipharyngeal rods slender, nearly straight, diverging lateroposteriorly. Mandible distally rounded, with a sharp tooth on each inner cutting edge; without retinaculum.

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ILLUSTRATIONS

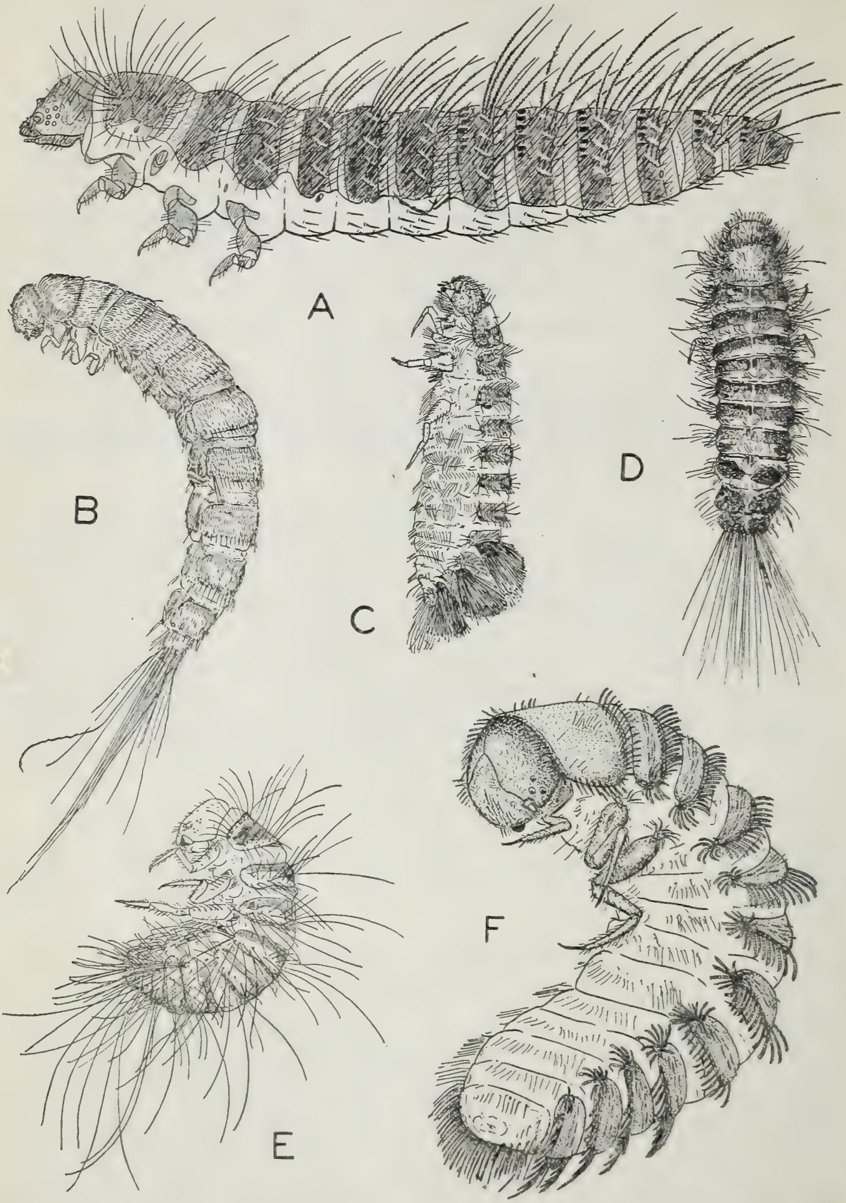

FIGURE 1.—Larvae of (*A*) *Dermestes vulpinus*, (*B*) *Attagenus piceus*, (*C*) *Anthrenus verbasci*, (*D*) *Trogoderma ornata*, (*E*) *Apsectus hispidus*, and (*F*) *Thylodrias contractus*. (Drawing *A* by author; *B*, *C*, *D*, *E*, and *F* by Böving.)

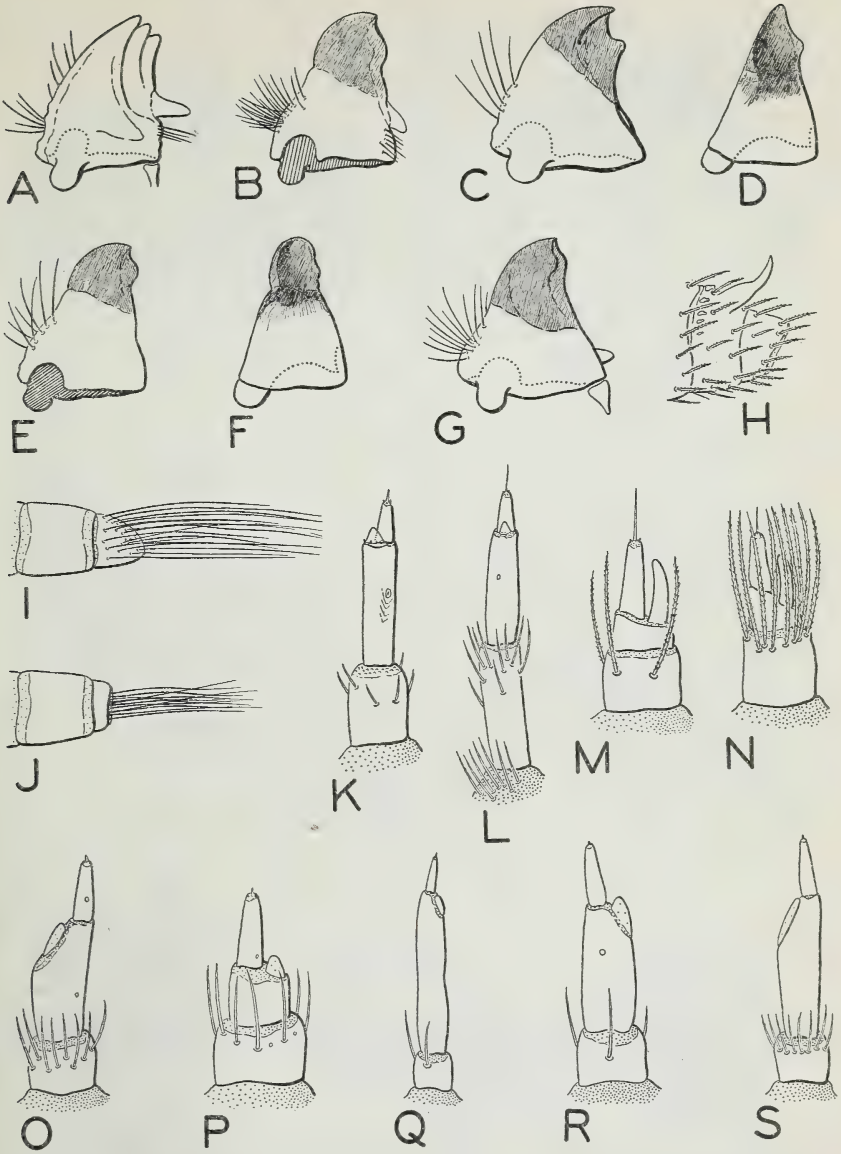

Figure 2.—Anatomical details of dermestid larvae: *A*, right mandible of *Dermestes vulpinus*, ventral view; *B*, left mandible of *Attagenus piceus*, dorsal view; *C* and *D*, right mandible of *Apsectus hispidus*, ventral and buccal views, respectively; *E*, left mandible of *Thylodrias contractus*, dorsal view; *F*, right mandible of *T. contractus*, buccal view; *G*, right mandible of *Trogoderma versicolor*, ventral view; *H*, ninth and tenth abdominal segments of *Dermestes vulpinus; I*, eighth and ninth abdominal segments of *Attagenus piceus; J*, same of *Novelsis hornii; K–S*, antennae of (*K*) *Dermestes vulpinus*, (*L*) *Attagenus piceus*, (*M*) *Apsectus hispidus*, (*N*) *Thylodrias contractus*, (*O*) *Perimegatoma jayni*, (*P*) *Trogoderma versicolor*, (*Q*) *Anthrenus vorax*, (*R*) *A. verbasci*, and (*S*) *Ctesias serra*. (Drawings by author.)

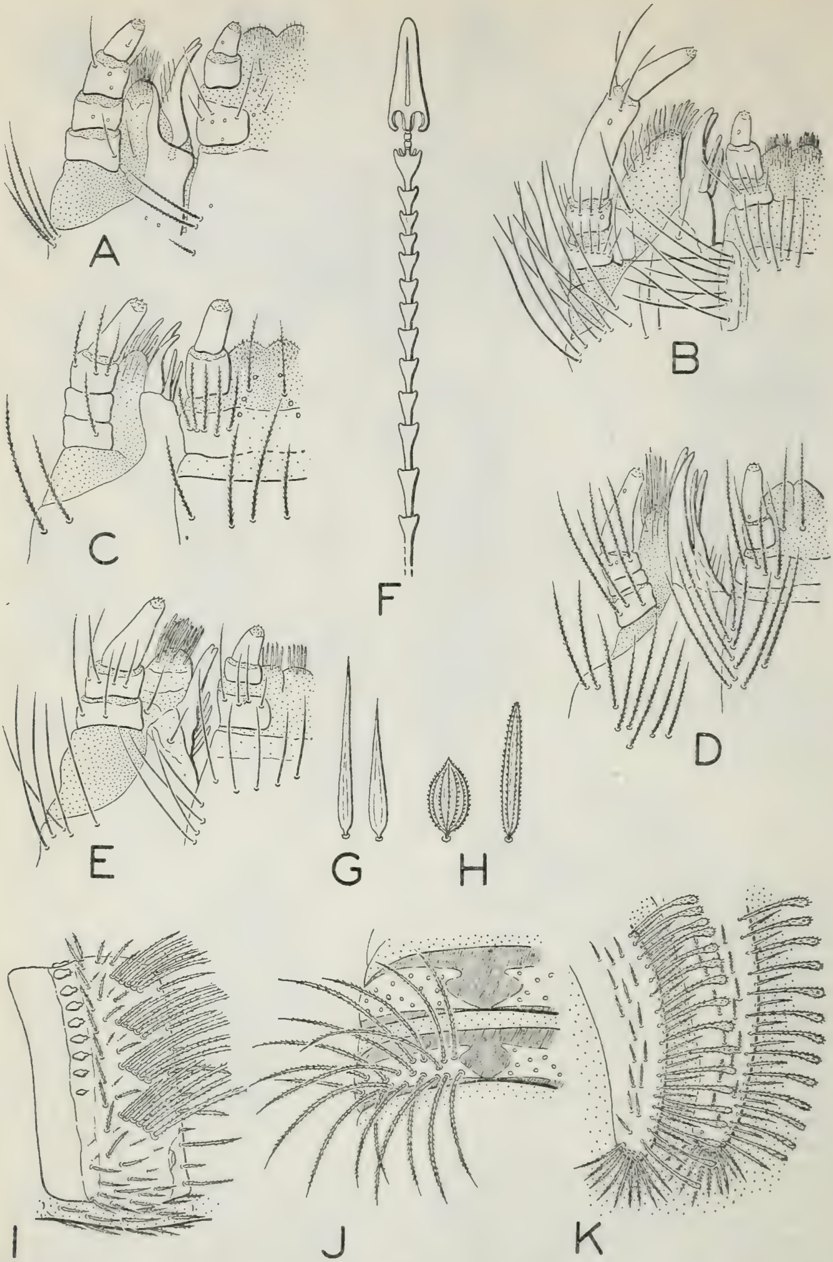

FIGURE 3.—Maxilla and labium of larvae of (*A*) *Dermestes vulpinus*, (*B*) *Attagenus piceus*, (*C*) *Apsectus hispidus*, (*D*) *Thylodrias contractus*, and (*E*) *Trogoderma versicolor;* hastiseta of larva of (*F*) *Trogoderma ornata;* setae of larvae of (*G*) *Attagenus piceus* and (*H*) *Novelsis hornii;* sixth abdominal segment of larvae of (*I*) *Dermestes vulpinus;* abdominal segments of larvae of (*J*) *Apsectus hispidus* and (*K*) *Thylodrias contractus*. (Drawings by author.)

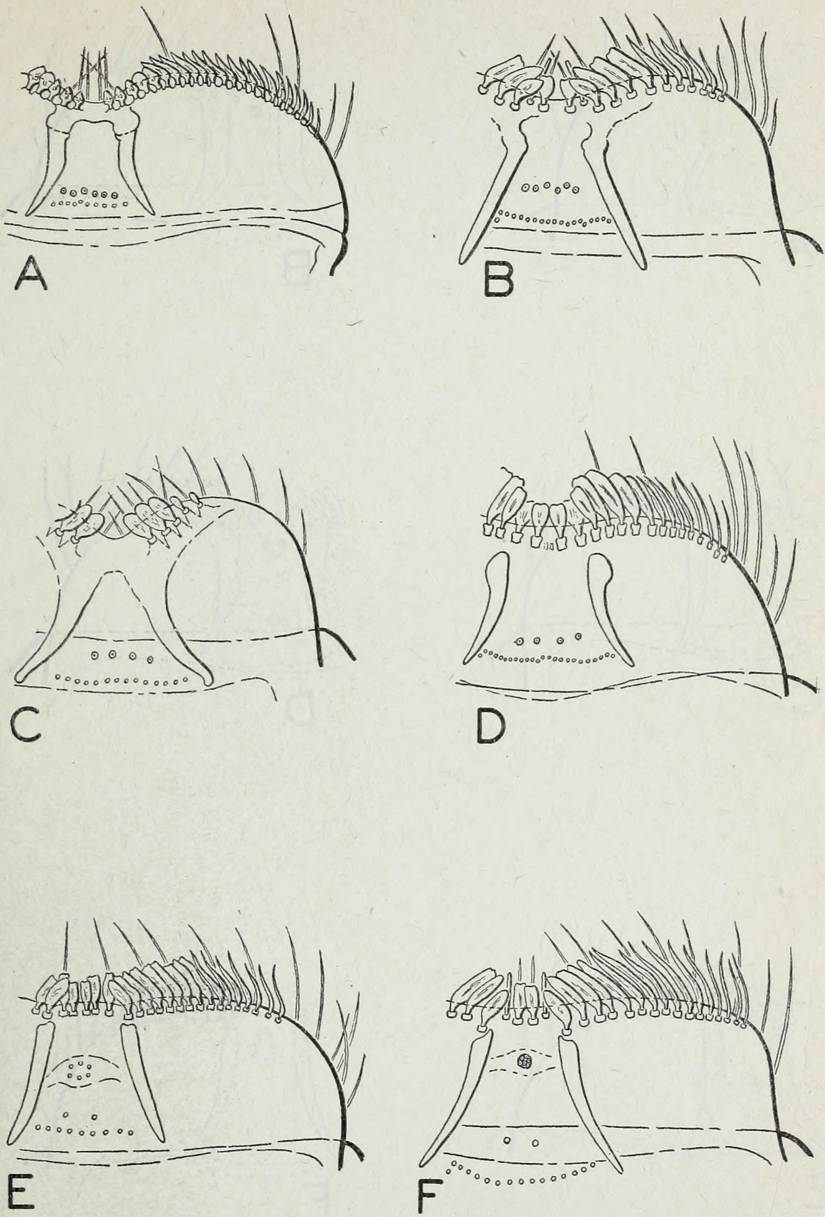

FIGURE 4.—Epipharynges of larvae of (*A*) *Dermestes vulpinus*, (*B*) *Attagenus piceus*, (*C*) *Apsectus hispidus*, (*D*) *Thylodrias contractus*, (*E*) *Perimegatoma jayni*, and (*F*) *Trogoderma versicolor*. (Drawings by author.)

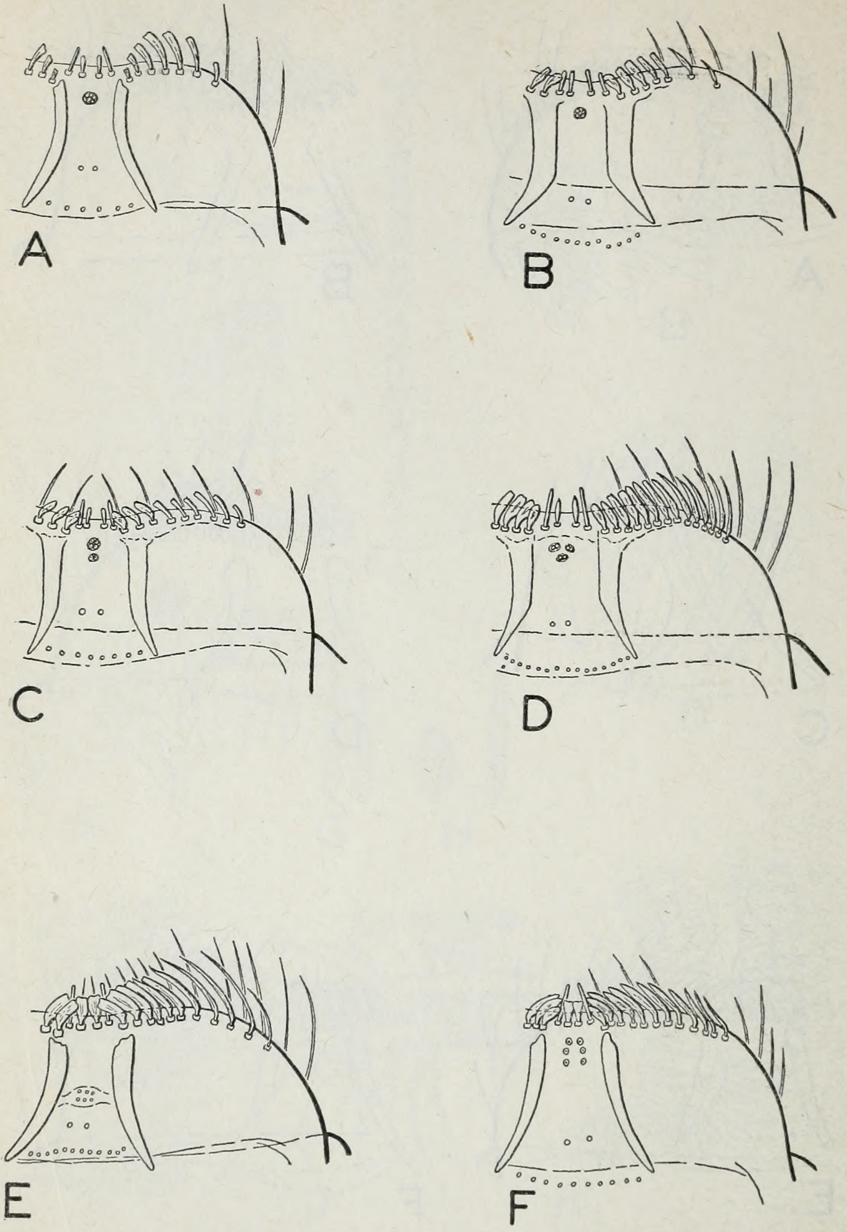

Figure 5.—Epipharynges of larvae of: (*A*) *Thaumaglossa americana,* (*B*) *Cryptorhopalum dubium,* (*C*) *Globicornis* sp., probably *fulvipes,* (*D*) *Labrocerus simplex,* (*E*) *Anthrenus verbasci,* and (*F*) *Ctesias serra.* (Drawings by author.)

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